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Keywords: conservation, wildlife, bushmeat, women, informal economy, equity

INTRODUCTION

Throughout human history, meat harvested from terrestrial wild animals (hereafter ‘wild meat’) has been widely consumed in sub-Saharan Africa. Particularly in rural forested regions, wild meat has been shown to provide essential nutrients and livelihood opportunities to rural communities (Coad *et al.* 2019). Wild meat is also sold and consumed in urban areas (e.g., Anstey 1999; Trefon and de Maret 1999; Wilkie *et al.* 2005), but it has only recently gained substantial research attention in the face of increasing human population growth and urbanization. Sub-Saharan Africa is predicted to double in population size between 2019 and 2050, and to sustain this rapid population growth until at least 2100 (UNPD 2019). Between 2020 and 2050, the percentage of people living in urban areas in sub-Saharan Africa is expected to increase from 41.4% to 58.1% (UNPD 2018). Trade of wild meat has been identified in many towns and cities in West Africa (e.g., Minhós *et al.* 2013; McNamara *et al.* 2016), Central (e.g., Edderaï and Dame 2006; Cronin *et al.* 2015), East (Lindsey *et al.* 2011), and Southern Africa (Schlesinger *et al.* 2015) as an important income source. The supply of wild meat to these urban areas is unsustainable given projected human population growth, growing urbanization, and dwindling wildlife areas.

Addressing the sustainability of wild meat consumption is critical for achieving the United Nations Sustainable Development Goals (SDGs), particularly SDG 15 to protect terrestrial ecosystems, halt biodiversity loss, and ensure sustainable use. It is also essential for reducing the frequency and impact of zoonotic disease transmission to human populations, a point abundantly emphasized by the COVID-19 pandemic. Given that selling wild meat can be a primary source of income for some people along the supply chain, wild meat is, therefore, also relevant to other SDGs. The livelihoods of hunters in rural areas have received significant research attention (e.g., Coad *et al.* 2010; Kümpel *et al.* 2010); however, non-hunting wild meat traders and other actors also generate livelihoods from selling wildlife and need to be considered when implementing potential wild meat policies (Solly 2004; Ingram 2020). These wild meat market

workers form a large group of actors within the informal wild meat trading sector. Across much of West and Central Africa, women play a predominant role as wild meat traders, processors, and vendors (Addo *et al.* 1994; Bennett Hennessey 1995; Pailler *et al.* 2009; Mbete *et al.* 2011). Women are also half as likely to be salaried as men, as in other developing nations (e.g., in Cameroon: women 11% and men 29%; Tsafack-Nanfosso and Zamo-Akono 2009); they also represent the largest unemployed group and the majority of informal sector workers (NIS 2010). The participation rate of young people into the informal labor sector in Cameroon has increased from 2005 to 2015, largely accounted for by the migration of younger people into urban areas participating in the informal labor force (Tchakounté and Mbam 2016). Hence, the informal wild meat trade may well play an important role in female income and economic independence. Therefore, addressing the sustainability of the wild meat trade has management implications relevant to gender equality (SDG 5), education (SDG 4), availability of decent work (SDG 8), sustainable cities and communities (SDG 11), and poverty (SDG 1) among others.

Interventions aimed at reducing wild meat use have largely focused on reducing hunting in rural areas, particularly around protected areas, through law enforcement activities and alternative livelihood projects (the latter with limited success, see Wicander and Coad 2018). In urban areas, support for law enforcement interventions has been sporadic while attention has largely focused on understanding the urban consumer (Chausson *et al.* 2019), and reducing consumer demand through behavior change campaigns (Veríssimo *et al.* 2018; Wright 2018). However, few studies have focussed on the role of other actors across the supply chain, or investigated the reasons for their involvement, despite calls for understanding how people trade-off economic and social costs and benefits in a wild meat trading system (Brown 2003; Davies and Brown 2007; Dobson *et al.* 2019). Investigating the socio-economic, cultural and structural factors underpinning the wild meat trade is essential to better understand what role development could play in managing the wild meat system and ensuring positive outcomes for both wildlife and people (Rose 2001; Brown 2003; Solly 2004; Bennett *et al.* 2006; Ingram 2020).

Here, we explore factors motivating individuals to join the urban wild meat trade in Cameroon, Central Africa. This study examines the roles of demography (e.g., age, sex, education) and ethnic ties in

shaping a large urban wild meat market in Yaoundé, Cameroon. We then evaluate the extent ethnic origins and historical gender roles influence one's ability to participate and to prosper within the urban wild meat trade. Specifically, we examine: 1) whether rural-to-urban migrant women with kinship ties to forested villages are more likely to trade and sell wild meat in urban Cameroon than any other demographic group; and, 2) whether social kin networks to wild meat source areas enable enhanced access to the trade.

MATERIALS & METHODS

Study sites

The study was conducted in two major urban hubs for the wild meat trade in Cameroon (Figure 1): Yaoundé (~2.349 million inhabitants by the 2010 census at the time of the study) and Abong Mbang (~29,005 inhabitants in 2005). Yaoundé is the rapidly expanding capital city, and since Cameroon gained independence in 1960, Yaoundé's population has grown from ~6000 inhabitants to ~4M inhabitants by 2020. This urban population has grown ~3.6% per annum (CIA 2015). Yaoundé now spans a surface area of >310 km². The rapid growth of both surface area and population density were driven predominately by rural to urban migration. In Yaoundé, relatively recent rural-urban migrants comprised >50% of total residents (BUCREP 2010), and 46.9% of internal rural-urban migrants migrate in search of work/livelihoods (Abomo *et al.* 2013).

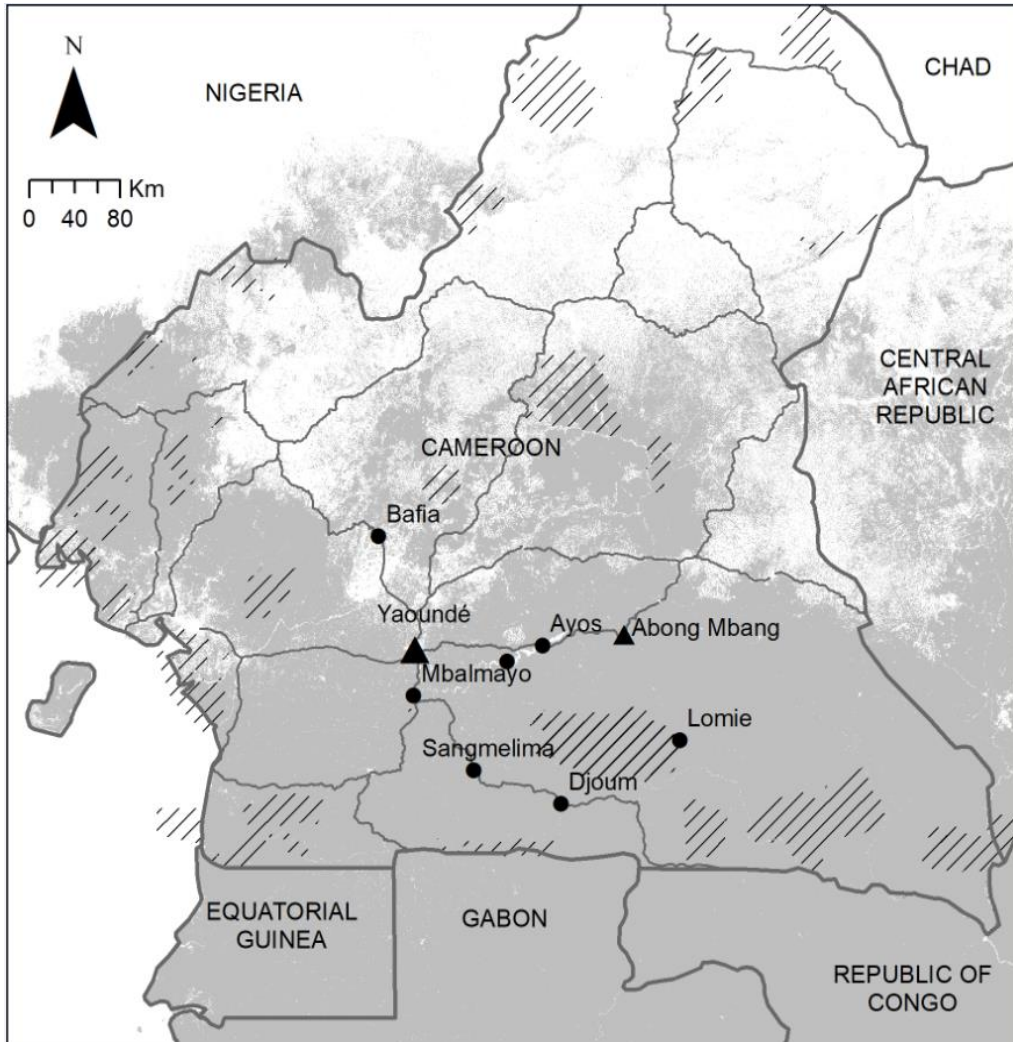


Figure 1. Map of the study sites within Cameroon: Yaoundé and Abong Mbang (triangles). Map also shows other towns mentioned in the study (circles), country boundaries (thick grey lines; ESRI 2015), protected areas and national parks in Cameroon, including those in marine environments (hashed lines; UNEP-WCMC and IUCN, 2020), primary roads (thin grey lines; World Bank Group 2009), and forest cover above 50% (grey shading; Hansen/UMD/Google/USGS/NASA; Hansen *et al.* 2013).

Although the primary focus of this study site was concentrated in Yaoundé, the market workers in Abong Mbang were also studied for comparison. Abong Mbang is a central trading town for wild meat, located at a road juncture for the South and East Provinces, the most densely forested regions of Cameroon.

Methods

The first author conducted all in-person ethnographic data collection and led analyses for this study. In 2008, visits by the first author to the Yaoundé wild meat markets identified the difficulties of systematic data collection among illicit market vendors. Selling wild meat and/or being in possession of Class A and B protected species without a permit is illegal in Cameroon (Law No. 94/01). In long-standing wild meat markets such as in Yaoundé, vendors had previously experienced working with researchers whose work they believed resulted in increased law enforcement activities (e.g., CEW 2000), thus crippling their main livelihood source. Given these experiences, most vendors were not interested in engaging with researchers. Yaoundé wild meat market vendors did not permit the taking of notes or photographs, or recording of interviews while in the market. Therefore, studying Yaoundé wild meat markets required a mixed methods approach. Bassett (2005) found that ethnographic methods with hunters in Côte d'Ivoire yielded information on buying and selling circuits, the most common wild meat species marketed, clients, species preferences, relative abundance of certain animals, and relationships between buyers, police, and forestry guards. Drawing from Bassett, we used a collaborative ethnographic approach to study the actors in the primary urban market.

During the core data collection period from February 2009 – April 2010, four main methods were used to assess demographic, social, and economic motives for trading wild meat, as described in detail below: 1) censuses of actors at all Yaoundé wild meat markets; 2) wild meat profit and sales surveys; 3) ethnographic immersion in the primary Yaoundé wild meat market and along trading routes to this market; and, 4) semi-structured interviews with wild meat traders and vendors in Yaoundé and Abong Mbang.

To estimate the actors involved in the wild meat trade in Yaoundé, and to develop a typology of market actors, we conducted censuses of market suppliers and vendors. Firstly, a visual counting technique was used to estimate the number of vendors at all wild meat markets in Yaoundé. After three months of participant observation in the primary market in Yaoundé (Method 2), an in-depth census of all actors involved in the primary market was conducted to reveal the composition of actors linking urban market

vendors to rural forested villages. This census method allowed us to count ‘invisible’ market actors who would otherwise not be counted from visual market censuses alone. Accurate depictions of these actors and their numbers would be challenging to obtain through cursory interviews, so the trust of traders was gained over the study period in order to understand the identities, roles, and demographics of other actors in this market. The gender, age and time working in their given market occupation was recorded for each actor. There were distinctive roles within this market setting, so we developed a typology to describe wild meat market roles. Given that some actors were both vendors and traders, we classified those who regularly sold in the markets as vendors and included a discussion of the various types of vendors and traders. Validity and reliability of this in-depth census were improved through multiple observations and interviews with informants over the two-year sampling period as well as with multi-sited comparisons between urban and peri-urban markets (in both Yaoundé and Abong Mbang).

From April 2009 to March 2010, in collaboration with three key female market trader-vendors in Market A (the principal market studied), the first author collected market sales data three times per week to assess volumes traded and profit margins. For each item sold, the traders noted the locally-categorized species name, state (e.g., live, fresh, or smoked), quantity purchased, market sale price, trader’s purchase price (i.e., to calculate profit), and originating purchase point of the animal. All prices were converted to 2010 US\$ (1 US\$= 485.718 CFA; accessed on September 15, 2015 on OANDA.com). To tally differences across price data with large and small-bodied species, we then calculated the price per kilogram and profit margin (dividing profit by the sale price). We estimated gross wild meat trade biomass and revenues for all wild meat markets in Yaoundé by extrapolating to all 55 Yaoundé wild meat market vendors’ sales from this sample of Market A vendor sales. The documented sales (the sales of three traders for three days per week) were extrapolated to account for seven weekly sale days across the 19 traders in the primary market and 55 traders across all markets.

The first author conducted ~500 hours of participant observation to evaluate the social, emotional, and economic realities of Yaoundé’s primary market vendors and traders, their motivations for joining the trade, and their job-related benefits and risks. This approach to participant observation followed the

modified grounded theory approach and the constant comparative method (following Glaser and Strauss 1967; Strauss and Corbin 1998). The majority of these hours were spent in Yaoundé and Abong Mbang markets. Additionally, with permission, Yaoundé traders (n = 3) were accompanied on trading runs to note trade dynamics at the local village level, hunter and trader roles in the supply chain, and the nature of the trip from village to city. Photographs and notetaking were permitted in Abong Mbang and during trading runs. Direct documentation was not permitted in Yaoundé markets, so detailed notes and voice recordings were made following each visit.

Semi-structured trader and vendor interviews (n = 19, 1.5-2 hours each, Appendix A) complimented participant observation, at markets in both Yaoundé and Abong Mbang. A respondent-driven sampling (RDS) technique was used to identify interviewees, thereby allowing individuals to choose to participate, rather than be selected randomly. Respondent-driven sampling has been shown to work well with hidden populations (Heckathorn 1997, 2002; Vershinina and Rodionova 2011; De La Rosa et al. 2012). According to Heckathorn, “*a population is ‘hidden’ when no sampling frame exists and public acknowledgement of membership in the population is potentially threatening*” (1997). Given the sensitive nature of wildlife use in Cameroon, all vendor and trader interviews were conducted away from the market, and all names were changed to ensure anonymity of participants. Interviews were conducted in French in Yaoundé, and in Abong Mbang, two local research assistants conducted interviews in the local dialect¹ and translated local dialect responses into French as they transcribed responses. The first author then re-read all interviews and field notes, and coded according to themes contained in the data.

Ethical approval for the methods used in this study was obtained from Stanford University (IRB Protocol 15287). A research permit to conduct research in Cameroon was granted by the Cameroonian Ministry of Scientific Research and Innovation.

RESULTS

Market Description and Census

The census of open wild meat selling locations in Yaoundé revealed the following fixed location wild meat markets by size (Table 1): three large markets (i.e., 7-18 visible daily vendors), three medium (i.e., 3-4 visible daily vendors) and four small markets (i.e., one vendor). A network of actors including rural hunters, urban and rural traders, market vendors, restaurateurs and consumers fueled these markets. Every morning just before 6am, market traders, vendors, and restaurateurs (predominantly women) gathered to haggle over wild meat that traders had procured from surrounding villages. During the day, vendors waited for phone calls or visits from clients or traders and did their best to break even or make a profit each day, knowing that some days they would lose money. To avoid spoilage in transit, meat coming from further than a half-day trip needed to be smoked (no refrigerated transportation was available). For those few vendors and traders who could afford them, backrooms held reserves of smoked, frozen and live animals, including concealed live crocodiles.

Table 1. Yaoundé wild meat markets by number of sale points, vendors, storerooms and rare meat sold (yes=0).

Market	Mean sale points	Mean daily vendors female	Mean daily vendors male	Storeroom / freezer	Protected species sold	Primary wild meat source
A	18	15	4	10	Yes	Bus, personal contacts (East, South, Center)
B	15	8	7	6	Yes	Train (Adamaoua, East)
C	5	3	4	2	Yes	Train (Adamaoua, East)
D	4	4	0	0	Yes	Market B
E	4	3	0	0	No	Bus, personal contacts (East, South, Center)
F	3	3	0	Unknown	No	
G	1	1	0	0	No	Markets B and C
H	1	1	0	0	No	Market B
I	1	1	0	0	No	Markets A and B
J	1	1	0	0	No	Market B
TOTAL	53	40	15	18	4	

From the visual counts of the ten Yaoundé wild meat markets in 2009, women comprised 74% of observed wild meat vendors (40 of 54). In the three markets with the greatest number of vendors, ranked by size, women comprised 84%, 53%, and 43% of the vendors, respectively (Table 1). The high proportion of women vendors remained the same in at least the primary wild meat market in Yaoundé in 2019 (based on visits to the market by one of the coauthors).

Interviews with market vendors and traders indicated that visible counts of market actors significantly underestimated the actual number of actors involved. The primary market generated 59 actors (Table 2), as opposed to the 18 assumed solely from visual counts. If all markets have a similar hidden:visible actor ratio, then an estimated 153 total actors were engaged in trading, vending and cleaning wild meat in Yaoundé markets in 2009.

Table 2. Actors in the major Yaoundé wild meat markets by age, mean duration in job, percentage female, and ethnic group (SIL 2009).

Actors	n	Mean job time (yrs. \pm SD)	Age (yrs. \pm SD)	% Female	Ethnolinguistic groups ¹
Traders	21	Part Time: 6.4 \pm 4.3 (Range 2-10) Full Time: 3.6 \pm 3.2 (Range 1-60)	37.5 \pm 5.7 (Range 27-80)	65	60% Yaunde-Fang (Center, East, South) 20% Makaa-Njem (East) 5% Mbam-Central (Center) 5% Mandara (North) 10% unspecified
Vendors	19	5.3 \pm 2.1 (Range: 2-10)	36.8 \pm 5.8 (Range 2-50)	70	95% Yaunde-Fang (Center, East, South) 5% unspecified
Meat cleaners	19	1.6 \pm 0.9 (Range: 0.3-3.5)	25.0 \pm 4.8 (Range 18-36)	0	47% Yaunde-Fang (Center, East, South) 21% Makaa-Njem (East) 21% Mbam-Central (Center) 11% unspecified

To gauge the scale of the trade, volumes sold, and the profit margins of the wild meat trade, three primary trader-vendors recorded their sales over three days per week between April 2009 to March 2010 in the largest wild meat market in Yaoundé. Over this time period, 4112 market transactions (5258 carcasses) were documented, accounting for 35 gross tons of wild meat for ~US\$ 77,800 in gross total revenue (shown by animal groups and species in Figure 2). Extrapolating to seven weekly sales days and all 19 active daily Market A trader-vendors, US\$ 1,149,700 gross wild meat spending occurred annually in Market A alone between 2009-10. By extending these results to the 55 vendors selling wild meat across ten markets in Yaoundé during 2009-2010, we estimated that ca. 637 tons y^{-1} of wild meat was sold and generated ca. US\$ 3.3M y^{-1} gross revenues.

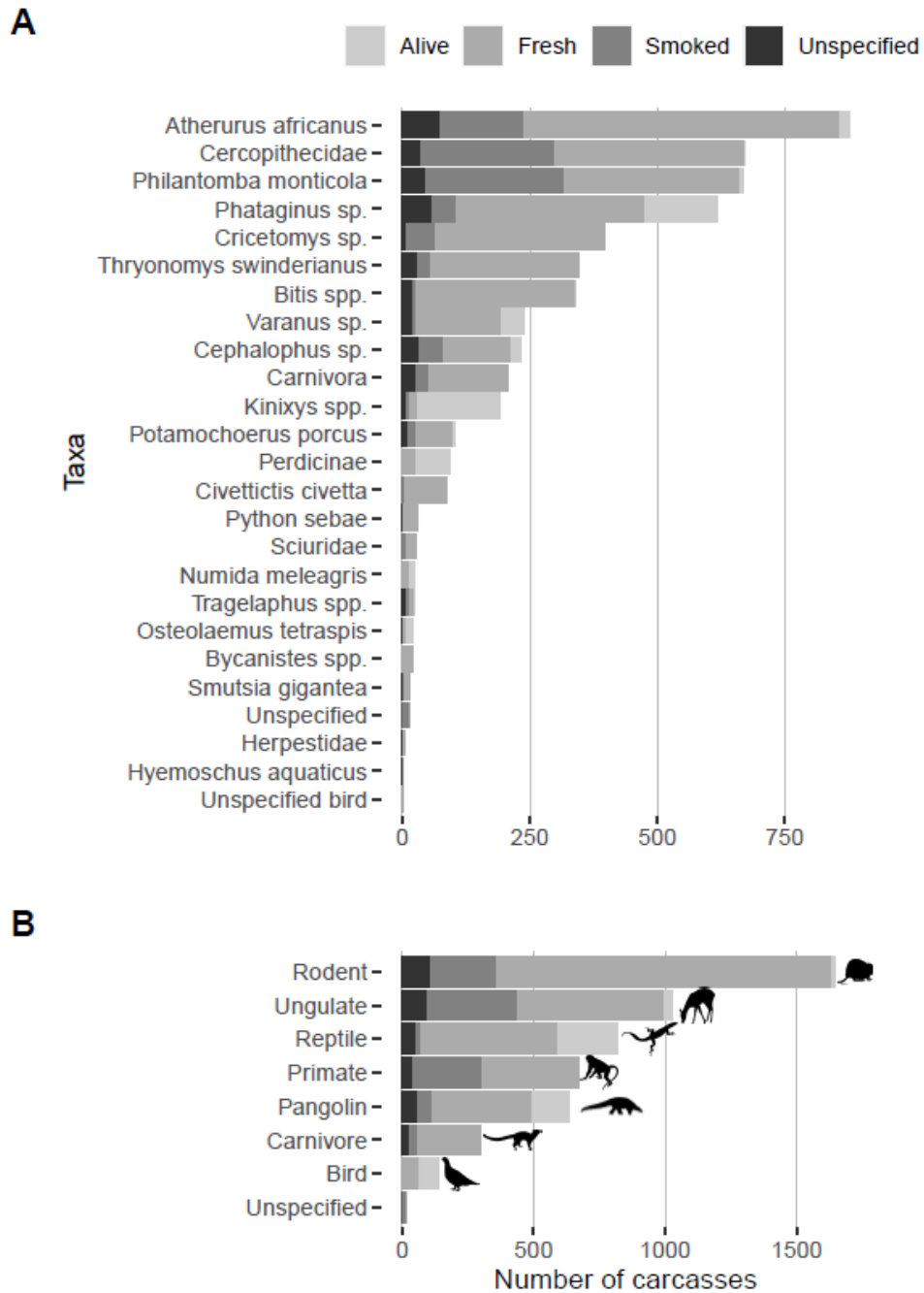


Figure 2. Carcasses (5258) from market transactions (4112) made by three primary market vendors in the main wild meat market in Yaoundé, surveyed three times per week from April 2009 to March 2010. Carcasses were identified to the most taxonomically resolved level possible (A), grouped to show broad trends in type of animal (B), and shaded by the state of the carcass.

Typology of Actors involved in the Urban Wild Meat Markets

Following visits to all markets, plus in-depth interviews and participant observation at the primary market, we developed the following typology of actors involved in the urban wild meat trade.

Traders

We identify as traders those individuals who purchased wild meat from hunters or other traders and brought fresh, live, frozen and smoked merchandise to market vendors between nightfall and dawn. Twenty known traders (67% of them women) sourced meat to the primary market. Rarely in the market, traders were generally invisible to market count studies.

The majority of traders originated from wild meat source points in the southern-forested zone of the country (Table 2). Traders were primarily Beti and Bulu (62%, $n=12$), two ethnic groups that are part of the Yaunde-Fang ethno-linguistic group whose original territory covered most of the Centre and South Regions of the country. Most other traders (33%) were from ethnic groups originating in the South and East Regions, within a day's drive from Yaoundé, with the exception of one trader who originated from the North Region (and had married a man from the South Region). They were young to middle aged adults (37.5 ± 5.7 years, range: 27-48), with the exception of one 80-year-old trader. The most common source points for full-time traders aligned with their ethnic and geographic origins, primarily in towns and surrounding villages in the Centre and South Regions: from Ayos, Akonolinga, Mbalmayo and Sangmelima to cities like Abong Mbang. All part-time traders and two full-time traders sourced meat from a broader geographical region, ranging from Bafia in the Centre Region to Lomie and Djoum (two-day trip to Yaoundé), next to the Dja Reserve.

Most full-time traders (62%, $n = 13$) provisioned the market multiple times a week from places under five hours drive from Yaoundé (53%, $n = 11$). The short distance to most source points allowed them to transport meat to the capital city in one day, which meant they could trade in more profitable freshly killed or live animals rather than smoked meat (the only viable option for longer-distance traders).

Some traders possessed a second job and would sell to regular wild meat vendors or hire close

family members or friends to resell their meat at a nominal daily wage. Part-time traders (i.e., possessing two or more jobs) included educators (two teachers and one school director), a farmer, a bar owner, a restaurant owner, a fish vendor, and a hunter. People who specialized in trading other products would use profits from one activity to buy wild meat in rural areas to resell in the city. All part-time traders with government and other formal sector private industry jobs were posted by their employers in rural or outskirts towns within a day’s drive of the capital city. These traders partook in wild meat trading to supplement their income, and benefited from living in source points and having existing income as base capital for purchasing wild meat. Part-time traders had been trading for nearly twice as long on average (6.4 ± 4.3 years, range 2-10 years) as full-time traders (3.6 ± 3.2 years, range 1-10 years; Figure 3).

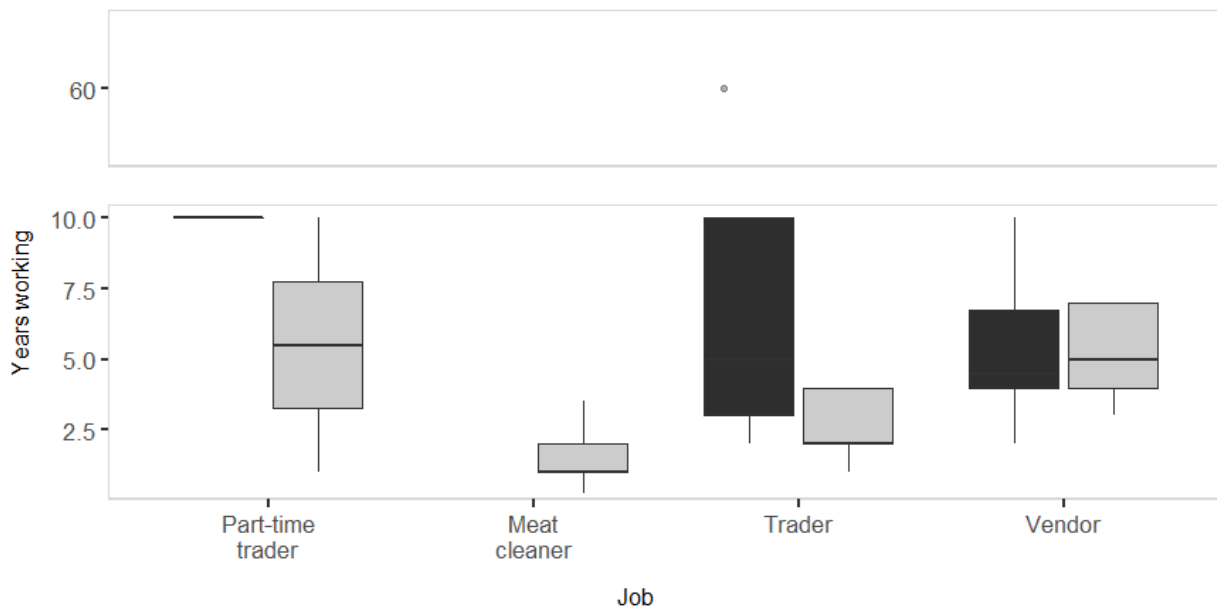


Figure 3. The length of time that female (black boxes) and male (grey) actors had worked in the main market in Yaoundé, Cameroon.

‘Bayam Sellam’ Vendors

The ‘*bayam sellam*’ (i.e., colloquial term for vendors or resellers [N’sangou, 1985], henceforth referred to as “vendors”) were responsible for selling wild meat at the market. There were 19 vendors in

total in the market, but it was rare to find them all there during the same period (thus the low number in overall market survey counts). Sometimes traders doubled as vendors, selling meat they had transported or had commissioned a trader to transport from source villages. Those with sufficient capital (~ US\$ 200) to buy meat from traders, traded meat themselves or placed regular orders for meat, while those lacking a capital base were hired to sell a trader's meat, recuperating a small fee from traders the following day (~US\$ 4 daily). When traders exhausted capital or excess wild meat stocks, many would resell someone else's meat in the market until they accumulated sufficient capital to buy more meat for trade. Thus, being a vendor encompassed a broad range of experiences.

Vendors originated primarily from the Centre and South Regions (closer to the Yaoundé market). A substantial majority of vendors in the market were female (70%) and Beti (95%) of the Yaunde-Fang ethno-linguistic group (Table 2). Vendors ranged from 20 to 50 years old (36.8 ± 5.8 years), and had sold wild meat for between 2-10 years (5.3 ± 2.1 years; Figure 3).

Meat Cleaners

Meat cleaners are another important 'invisible' group not accounted for in previous wild meat studies. Meat cleaners ($n = 19$) worked behind the scene, mostly out of the customer's view. This was the dirtiest, most physically demanding job of the market. All day, young men (100%) gutted, smoked or skinned carcasses for a nominal fee to the meat trader or customer. They stood over boiling cauldrons of water dipping carcasses to loosen and remove hair, swiftly removing entrails from an animal, at the request of customers. They also maintained a series of hot wood fires to smoke carcasses that had begun to decompose.

Meat cleaners uniquely originated from the entire southern-forested portion of Cameroon (South, Centre, Littoral and East Regions). Meat cleaners were young men (25 ± 4.8 years, range 18-36 years; Table 2) and worked this job for less than a third of the average duration for meat selling and trading (1.6 ± 0.9 years, range 0.2-3.5 years; Figure 3) likely due to the physically demanding and undesirable nature of the job. These men were primarily new immigrants to the city from rural areas and had fewer formal education

years than traders. Thus, meat cleaning served as an entry-level job into the wild meat market and the broader informal market.

Trader Motivations

In this section, we describe the demographic, social and economic motives for individuals to enter and thrive, or leave, the wild meat trade. These motives are drawn from interviews with traders in Yaoundé and Abong Mbang.

Economic motives

Two popular economic reasons were given for trading wild meat. The first was: wild meat was more profitable than other merchandise options in the informal market (*“la viande donne plus que des autres choses”*). The second most common response was: life is hard (*“la vie est dure”*). Traders explained that their livelihood options were limited so one was obligated to seek informal income options to support themselves and extended family, oftentimes including adopted nieces and nephews.

All traders cited income as their primary driver for selling wild meat. The median price per sale (including all species and weights) was US\$ 14 (IQR = 10.4 - 24.6), while median profit per sale was US\$ 0.60 (IQR = 0.4 - 1.0), reflecting the overall profitable yet volatile nature of wild meat trading. A trader's gross annual income from reported primary market sales was \$1815, before subtracting transportation and other expenses. Wild meat trading offered people the freedom that self-employment offers. It was also a physically and economically demanding occupation, from high variance in financial returns depending on seasonal supply, to considerable sunk investment costs, to irregular law enforcement meat seizures in markets and along trading routes. To reduce risk, many traders opted not to sell protected species, or only to sell these outside of the open market, due to the risk of imprisonment and capital loss. This stance represents a shift away from what was observed a decade earlier in Yaoundé, where gorilla and elephant meat was openly sold at the market (Bahuchet and Ioveva 1999).

People came to the trade from a wide variety of backgrounds, but they all entered the trade with

hopes of improving their income. Most traders had primary school education, but many held bachelors and technical computer skills training certificates; two possessed master's degrees. Some, who trained for formal sector administrative jobs, were unable to find work in the poor formal economic sector. Many came to wild meat after tiring of the physical demands and low returns of trading in agricultural produce.

Those who took on wild meat trading as a secondary job cited easy additional income as the principal reason for choosing this particular trade. Educators used wild meat trading to supplement their poor teaching salary (especially in the first 1-3 years of being posted to a school), selling on holidays and weekends. Two teachers abandoned teaching for economic reasons, citing astounding earnings of US\$300 and \$800 on a good trading day, surpassing lecture tour rates for a university professor. Another teacher in Bafia (an hour drive from Yaoundé) bought wild meat regularly from hunters in surrounding villages and then resold in Yaoundé on the weekends.

Some traders came by way of another trade, using profits interchangeably to buy each product (e.g., mackerel, fish, or beer for wild meat). Among these dual-traders, some discovered they could make more money trading in wild meat and abandoned the other trade (e.g., medicinal roots, plantains and other agricultural products) altogether.

Only one trader switched from full to part-time trading due to increased legal risks. In her hometown, Mindourou, near the Dja Biosphere Reserve, the Ministry of Forests and Wildlife (MINFOF) started seizing meat in storerooms². She then switched to trading in plantains, a product which posed little to no legal risk, but yielded lower economic returns than wild meat. She still came to Yaoundé to sell meat on weekends and during school holidays. Transporting meat by private car, she had previously made as much as US\$ 300 per sale-day.

Yaoundé traders required a capital base of US\$350 to \$450 (i.e., 150,000 to 200,000 CFA) for each trading day in order to purchase wild meat in source villages. Among Mbang traders cited a need for capital that was at least 3-fold less (US\$40-\$100) than Yaoundé traders for daily business implying that Yaoundé traders bought considerably more meat at higher prices before making the long journey to the capital city. Most traders accumulated merchandise over a few days to two weeks before transporting to large urban

markets. They needed to be financially able to deal with unpredictable revenues – break even, lose money, or make as much as US\$140 in revenues per day. Revenues fluctuated in response to many variables, including variable hunter success, informal law enforcers' taxation, and meat seizures.

After only eight years of trading, one trader had experienced one serious and two minor accidents on motorcycles during the rainy season. But she had also accumulated enough capital through trading and loans to purchase a car that enabled her to grow her operation rapidly, transporting far more than she could by motorbike or public bus. She made a comfortable living that allowed her also to buy a television and to remodel her home. She would be hard pressed to find another line of work where she could control and increase her income so significantly in such a brief period. She said the greater economic and physical risks were worth the eventual gains. In a short time, she had established herself as a prominent trader and had gained status in her family and community. Like her, many women traders and vendors were the sole or primary income earners in the family, paying for food and school fees through trading and reselling. They proudly exclaimed that this was a source of pride to be able to provide for a large family.

Another exceptional full-time 80-year-old trader supported through school seven children and now 15 grandchildren on her wild meat marketing income. She owned two storerooms and three freezers. Several of her children joined her in the trade to earn enough to pay school fees and purchase food for the family. Then she began transporting and accumulating additional meat to sell at peak price times, thus expanding her capital earnings. A purchased car also reduced her economic risk from meat seizures, because private cars were infrequently searched at roadblocks, unlike public buses.

Long-tenure (8+ years) part-time trader-vendors and multi-generation wild meat traders were the most successful in generating income over time. These long-tenure traders included part-time traders (e.g., teachers and bar owners) and full-time trader-vendors. Less-educated, older women with large social networks coupled with a family history in wild meat trading in the southern-forested zone of Cameroon were most likely to persist with the trade long-term.

Part-time traders worked for the longest average time, indicating the greater benefits accrued when a second job's pay subsidized wild meat trading. Part-time traders and full-time teachers usually had

sufficient capital to own 1-3 storerooms where they stored live reptiles in tubs, fresh primates and rodents in freezers, and an array of smoked wild meat. They accumulated wild meat during the week and sold large quantities on weekends, a peak buying time for high-status consumers.

Climbing the wild meat ladder

Vendors entering the market had the potential for upward mobility to successful traders over time. Choices and opportunities to move into the more lucrative trader role were driven by economics, age, longevity in the trade, and risk susceptibility. As vendors accumulated capital, they could become traders. Many successful traders started their business as vendors, slowly establishing regular contacts in villages and building sufficient capital base to begin trading in meat.

As traders aged and accumulated contacts and capital, they switched to a less physically risky role of coordinating and managing the trade from multiple source points remotely - paying others to transport meat to the city on their behalf – while continuing to resell in the market. Other traders with access to sufficient capital through various means (i.e., long-term trading, second job, spouse, or family inheritance) chose to manage vendors from the comfort of their homes, circulating through the markets to oversee vendors.

Traders who could withstand the uncertainty of having their meat seized, the physical risks navigating bad roads at night, and the psychological and social demands of the wild meat market could do well economically. Over time, traders could cultivate personal networks of hunters, traders, and transporters across several villages and towns to source wild meat. Traders built their capital base (i.e., financial reserves to operate their business) and saved to purchase investments such as freezers that enabled them to accumulate wild meat stockpiles and to resell at high prices during periods of high demand, low hunting return months. As their capital expanded, so did their ability to purchase other personal assets, such as houses and cars, to rent storerooms, and to pay for school and medical fees. Freezers helped diversify the location of their assets (home and market) and served as a risk reduction strategy in the event of law

enforcement raids. Storerooms and freezers also signaled one's relative economic status, social status, and longevity in the market. Personal cars helped traders transport more meat at lower risk than without transport.

With multiple well-established hunter contacts, well-networked traders supplied markets, restaurants, and individual consumers with mostly-common rodents, ungulates, primates, and reptiles. They also took special orders, which included rare species such as crocodile and elephant meat. These special-order contacts were sometimes powerful public officials and businesspeople and potentially useful for a suite of status-related decisions. In the absence of these gains, some traders left the market for less stressful trades. Others aimed to obtain formal sector jobs, but stayed with wild meat marketing due to limited alternative employment opportunities.

Education

Education influenced personal risk-benefit calculations and trading duration. For those with high school educations, full-time 20- to 40-year-old traders, wild meat trading was viewed as an inferior option to more secure trading or business opportunities. Traders of all ages with primary school or less education expressed a desire to build a wild meat career, especially for those with deep family ties to the trade; they were also more likely to stay in the trade long-term than those with higher educational levels.

Traders with high school diplomas and beyond desired other career options, chose not to take risks in trading in endangered species, and expressed dissatisfaction with their current work. They linked their unsanitary and stressful work conditions to chronic health issues and discontentment, and saw trading as a temporary job that would suffice until they could find a better job. As one trader explained: *"I don't want to do this work. It's only that there are no jobs. If I had 500,000 CFA (about US\$ 1000), I would open a stand and sell something else. This is too risky and I hate the fumes"*. The fumes refer to the stench of rotting carcasses. Another young woman trader had been trained to do secretarial work, and after two years searching in vain for a job, her sister invited her into the wild fish and wild meat trading business. She did

not enjoy the work and expressed a desire to move onto a safer job if she could find one, but she feared that would take a long time, given the state of the economy and her previous experience. Another educated trader saw trading as a means into other informal market trades: “*wild meat marketing isn’t something to do long-term. I can do it for a bit and then leave it and build my own business*”. These perspectives indicate that formally educated people would likely not engage in the wild meat trade if alternative jobs with similar monetary benefits existed.

Ethnic ties and social mistrust to maintain a quasi-legal trade

Wild meat embodies a centuries-old livelihood and cultural exchange system (Quinn 2006). In 2010, the majority of traders (85%), meat cleaners (89%) and *bayam sellam* vendors (95%) within this primary market originated from forest-based southern Cameroonian ethnic groups (Table 1). They spoke at least one dialect from a forested zone. Immigrants tend to select destinations where they have family, community, or ethnic ties (Lucas 1997, Winters et al. 2001, Munshi 2003, Goel and Lang 2012, Chiswick and Miller 2014). Facing a challenging labor market in Cameroon, many recent internal immigrants found work in informal sector markets, such as the wild meat trade, through kin or friend social networks, in turn selling products from their rural home region. Thus, while economics motivated people to join the trade, social and linguistic ties facilitated access to the trade and success in the endeavor.

Shared language or close friendship connections were necessary to establish a sale spot in urban markets and trust-based trade relations in source villages. Established traders or vendors vouched for the character of new traders and were held responsible for the new trader’s actions. These ties served as a filter to accept only those possessing overlapping social network kin or friendship ties with established marketers. Conversely, traders and vendors were less likely to betray one another, given the risk of being exposed and shunned in their larger social network. Bargaining in a shared local dialect also helped reduce prices and established trusting relationships between trader and hunter/fisher. Traders often brought *beinets* (donuts),

salt, and onions for 'their people' in the village: in-kind gifts that symbolized and reaffirmed their familiar trading ties.

Beti people of the Yaunde-Fang ethno-linguistic group were the dominant ethnic group in the primary wild meat market and one of the dominant groups within the city. Historically, Beti would offer their ancestor names in order to establish any possible ties of kinship between the two strangers, highlighting a deep reliance upon kinship to establish trust and consideration for inclusion in one's social network (Quinn 2006). Trust in the wild meat market also divided along both kin and ethno-linguistic lines.

Wild meat falls in the realm of quasi-legal trade items. While government permits are technically available for wild meat vendors by animal species, season and country region, no-one was permitted to legally trade or sell wild meat in the market. Having a permit raised a flag to authorities that you were trading. Most wanted to keep a low profile officially while also maintaining relationships with (and sometimes making informal payments to) MINFOF officials in Yaoundé and at all checkpoints to be able to trade. As many markets were not sanctioned, the government could close markets at any time, and people would shift their trade to a new location. This ubiquitous risk placed strain on market relationships.

Trader-vendors appeared to be friendly and highly interactive in the market, but multiple private discussions revealed an extremely low level of trust among marketers, sometimes even among kin. Traders and vendors gathered together in shared physical spaces to sell wild meat for safety and economic reasons. However, as a group, they were generally highly distrustful of each other, especially anyone suspected of harboring ties to law enforcers or conservation groups. Each trader ran their own business through personal contacts with hunters, other traders, restaurateurs and consumers. They made independent decisions and relied upon unique networks without the knowledge of the others in the market. Several small networks developed, situating competitors and collaborators in spatial proximity to one another. Trader-vendors did not know where most of their competitors lived and said they would not ask them for help if they had a family or money problem or needed advice. People relied upon few (2-5) trusted friends or family for daily support in their business. These types of relationships were perceived as necessary precautions given the potential for law enforcement efforts to disrupt their livelihood source.

Most traders established trusted hunter contacts through close friends and people in their natal village. While more challenging, a trader with no personal connections to a source point could establish trust and contacts over time through several visits to villages. Despite the ethno-linguistic ties that drew people to the trade, the oldest woman trader in the market (the 80-year-old) warned “*Most of these women are bandits! If you lend them money or meat [to sell], they will never pay you back*”. She said it a few times to drive the point home: “*You are better off not associating with them*”. As needed, they utilized a formal hierarchical management structure to resolve challenging disputes between vendors. Mistrust between wild meat market actors appeared to be a product of fears of others’ intentions (jealousy, in particular) on top of safeguards necessary in a legally sensitive trade.

Social-spatial organization in market

Within the market, social hierarchy could be mapped by relative position in the physical space. Fish were sold at the entrance because that trade was legally benign. Meat traders with relatively brief time in the trade sold in the middle market space. Well-established traders and vendors, yielding much power and influence over the functioning of the market sat in the back corners of markets near stockpile storerooms, where other traders, clients and friends would come visit, purchase, deliver meat, place orders, and discuss trading matters with them. Next to their rear-market vending location, coveted storerooms stored live animals and surplus frozen and smoked meat. Storerooms also doubled as quick, reliable, hiding locations in the relatively rare event of a market raid (i.e., approximately one raid per year reported during this study period). The spatial embeddedness of rare, long-standing meat traders in the marketplace provided a buffer against whistleblowers and law enforcers and a filter for low purchasing power market buyers. Thus, the social landscape was quite structured with each trader assuming the same selling location each day. The overall social-spatial structure of the market, protected rare species and large-scale traders, and enabled the persistence of the market.

DISCUSSION

In Cameroon, as with much of sub-Saharan Africa, urban populations are expanding faster than the overall population, reflecting the enduring urban employment myth in rural Africa (De Brauw et al. 2014). The informal economy in Cameroon accounted for approximately 90% of the economy in 2010 (Ehode and Tourere 2020), highlighting the important role it plays within the lives and livelihoods of Cameroonians. Informal markets such as the wild meat trade provide jobs and mobility for a network of individuals, households, and communities extending from rural villages to sprawling cities. Wild and agricultural resources often move from rural areas to urban markets through diffuse kin and ethnic networks, responding to market supplies and consumer demands of urban Cameroonians, many of whom are internal migrants. Street restaurants and food markets also provide wages for many urban Africans (e.g., Diouf 1981; Mainet and Mainet 1990; Chauliac and Gerbouin-Rerolle 1994; Crush and Battersby 2016), and in Cameroon this includes the sale of wild meat (Edderai and Dame 2006). Yet, reducing urban trade and consumption of wild meat has been identified as a key intervention point to reduce unsustainable use of wildlife (Wilkie et al. 2016), and to avert growing public health concern. Focusing on the actors involved in the urban wild meat trade in Yaoundé, this study highlights the need for solutions to produce alternative livelihood opportunities, involving market actors in the design process and incorporating social safeguards to enable an equitable transition away from the urban trade in wild meat.

Actors and their motivations in the urban wild meat trade

In short, we found a thriving informal wild meat economy in Cameroon with many behind-the-scenes actors, unaccounted for in studies that only employ visual counts of vendors in the market. To our knowledge this is the first study based on over a year's ethnographic investigation into urban wild meat market actors, and their motivations for their engagement in the trade.

We found that four key factors appear to influence individual decisions to pursue work in the urban wild meat trade: (1) weak individual economic circumstances translating to a lack of employment

opportunities, (2) ethno-linguistic and social networks facilitating trade of rural goods in urban areas, (3) relatively low risks (i.e., minimal law enforcement), and (4) women's unique historical position of power in informal wild meat markets. The wild meat market represented a most promising job option in a bleak economic landscape, a proven path to economic independence, and freedom to support families. Women and men, but particularly women, across the developing world rely upon informal markets to derive cash necessary for food, school and health fees. Given the historically and culturally powerful role women play in processing and selling wild meat, this trade provides an important cash-generating option for urban women originating from forested zones in Cameroon.

We found that women dominated the urban wild meat trade as powerful traders, vendors and restaurateurs, while young men were largely subjugated to the low-ranking meat-cleaning roles in urban markets. Women entering as vendors with no base capital (i.e., financial safety net to purchase wild meat) could attain trader status in merely two years, making it an attractive option for less-educated women seeking economic independence. However, many women with high school education and beyond also joined the trade but expressed preference to leave as soon as possible if and when a better employment opportunity became available. The relatively brief duration on the job for full-time traders compared with part-time traders reflects how the fluctuating wild meat trading works well paired with another income source. Wild meat trading also supplements other income sources, including poor or delayed government salaries (commonly reported in the first years of teaching in a new location, for example). Together, these results emphasize that individuals will engage in informal economic endeavors accessible to them, whenever they are lacking opportunities for sustained employment and adequate pay, even when they have higher education levels. Our results therefore underscore the importance of initiatives to increase job creation and support entrepreneurship and innovation in rapidly growing tropical cities, in alignment with SDG 8 which aims to promote and increase decent work and economic growth.

Reforming wildlife policies with market traders

Wild meat policies focusing primarily on rural hunters and traders or urban and rural consumers overlook the critical role and strategic position of commercial urban traders and vendors. Urban traders and vendors are embedded in a broader wild meat network, they possess critical insights about the entire trading system, and have access to rural hunting villages, transporters, urban consumers and restaurants. Successful monitoring and management of the wild meat trade requires engagement with multiple actors at different levels of the trade, including urban traders (Bassett 2005; Cowlishaw *et al.* 2005; Nyaki *et al.* 2014). This study highlights the unique knowledge that urban traders possess of nearly all wild meat actors ranging from rural to urban areas. The omission of wild meat trade actors from discussions to shape policies and approaches will forever reduce the chances of equitable development, public health, and environmental sustainability.

The informal sector is a vibrant entrepreneurial space in urban Africa where people create livelihoods and careers with kin and ethnic connections. Calls to eliminate markets selling wild meat pose social justice and gender equity issues, every time they are enacted without appropriate support for actors engaged in the trade. Wild meat management initiatives will need to work collaboratively with development-, health-, environment- and gender-focused policy makers, because all are implicated in wild meat policies. The demographic and economic drivers to pursue particular jobs in an urban wild meat market demonstrate the conservation imperative to couple social and ecological needs, even at the urban level.

Informal markets are the life force of Cameroon as a nation and this region's economy, in particular, encompassing complexity and opportunity (Achua and Lussier 2014). The urban wild meat trade forms part of a successful informal grassroots economy despite generally weak economic circumstances. Traders expressed pride in their ability to support their families, create their own work, escape domestic violence, gain independence from their husbands (for women traders), and improve their quality of life through this trade. Partnered efforts between the state and conservation organizations to close wild meat markets via sporadic market raids have been detrimental to traders and vendors, while also not adversely impacting markets. Indeed, comparisons with previous studies in Yaoundé reveal that the trade has actually increased over a decade during which law enforcement efforts also increased (Edderai and Dame 2006; Randolph

2016). At present, the sporadic law enforcement approach used in the markets in Yaoundé will likely result in driving the trade and traders further underground, making it harder to detect and thwart the trade.

Traders' and vendors' intermediary position between hunters, restaurateurs and home consumers provides a unique opportunity to understand and reshape a more sustainable trade. Engaging particular long-term actors (i.e., those of high status, and highly connected) to co-design revised wild meat trade policies could influence the entire network of traders and vendors. Another approach would be to engage peripheral actors such as marginal, well-educated traders who expressed dissatisfaction with their jobs to identify pathways necessary to create alternate livelihood means for current traders. Officials tasked with controlling the wild meat trade should engage expert traders with extensive knowledge and experience with the wild meat trade to co-design policies that would value livelihoods, wild animal populations, and cultural traditions enacted through the trade and consumption of wild meat.

The common practice of the Cameroonian government to post government officials to regions where they have few family and ethno-linguistic ties and to delay the start of salaries may indirectly contribute to the trade of illegally harvested animals and forest products across the country. Enhancing civil servant salaries and paying these immediately rather than waiting 1-3 years may reduce their need to supplement wages through wild meat trade. Previous experiments triangulating law enforcement – simultaneously using several branches of law enforcement with independent observers – effectively reduced corrupt wildlife law enforcement at rural checkpoints and villages (GTZ senior employee, pers. comm. 2010). This technique could be employed alongside fair government wages implementation to curtail natural resource exploitation.

Given the link of the COVID-19 pandemic to markets selling live animals and meat in Asia, several conservation organizations and the Chinese government have called for a ban on all wildlife markets in 2020 (Andersen *et al.* 2020; Zhou *et al.* 2020; Li 2020). When wild meat markets were forced to close following the 2013-2016 Ebola outbreak in West Africa, the trade moved underground and public trust in authorities dwindled (Friant *et al.* 2015; Bonwitt *et al.* 2018; Duonamou *et al.* 2020). However, there is an opportunity to engage traders and vendors in a more productive manner regarding health concerns. For

example, in Cameroon, market actors are not always aware of potential health risks of the wild meat trade, particularly regarding blood contact (Saylor *et al.* 2021). In our study, market actors expressed concerns about the health and sanitation conditions in the market and the related adverse impacts on their own health. Health could therefore be an important lever for initiatives to reduce the urban wild meat trade. Engaging informal market traders, health officials and law enforcers in a participatory process may generate innovative approaches to address the common-pool resource, food security and public health concerns inherent to the wild meat trade (Nyaki *et al.* 2014; Gray *et al.* 2015). In the absence of such engagement, increased command-and-control style law enforcement practices will be ineffective and will likely displace these marketers or drive them, and the flow of wild meat to the city, underground to avoid punishments and penalties.

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ENDNOTES

¹ Cameroon has one of the highest language diversity indexes (0.946) in the world; with 279 distinct living languages and the seventh most diverse country indexed in *Ethnologue* (Lewis 2009), the most extensive language classification system available. Given the diversity of languages and the potential significance of ethnicity in shaping wild meat preferences in Cameroon, actors were clustered by ethno-linguistic families using *Ethnologue*.

² Law enforcers generally did not impose fines when seizing meat from market storerooms due to the physical dangers to stay and confront traders and vendors. They were also sympathetic to wild meat vendors, traders and hunters given the culturally valuable nature of wild meat and thus were sometimes hesitant to impose fines and enforce the law every time. Anecdotally, the first author learned that some traders also established relationships with law enforcers in the city and along trading routes and were not above bribes to maintain their business.

Appendix A

Trader Interview Question Guide

Note: Several months of relationship building with trader interviewees preceded these interviews.

Decision to Trade wild meat

1. I would like to talk to you a bit about your experience trading wild meat. How long have you been trading wild meat?
2. How did you decide to begin trading wild meat?
 - a. Why wild meat? Why not another trade?
 - b. Did someone you know bring you into the trade? Who was that (what relation to you)?
3. What job did you do before this job?
4. What are the advantages of trading wild meat?
5. What are the disadvantages of trading wild meat?

Demographics

6. What tribe(s) (ethno-linguistic groups) do you belong to?
7. What religion (if any) do you identify with?
8. What is your marital status?
9. What is your highest education level?
10. What is the name of your hometown, city or village?
11. Where do you currently live?

wild meat Sourcing, Dangers, and Income

12. From which villages or towns do you source (obtain) wild meat?
13. Where do you sell your wild meat? (restaurants, markets - which ones?). Please describe these sale points - hours, people involved, places
14. How many days per week do you trade in wild meat?
15. How much revenue do you normally make in a month from wild meat?
16. What means of transport (foot, car, taxi, bus, motorbike, etc.) do you use? Please rank these.
17. What is the duration of the roundtrip voyage to purchase wild meat?
18. What is the roundtrip cost of transport to trade daily?
19. What dangers have you encountered on your voyage - accidents, meat seizures, others?
20. What are strategies people use to avoid having wild meat seized?
21. Please describe what happened the last time your meat was detected at a checkpoint. When did this happen? What did the authorities do? What did you do? Did you have to pay a bribe? How much was this bribe?
22. Where are you most likely to have your meat seized - during voyage or at the market?
23. What amount of base capital do you need to trade (purchase meat to resell) each trading day?
24. What is your range of monthly income from wild meat trading?
25. What kind of wild meat do you trade?
26. What time of day do you sell wild meat?
27. What is the main source of income in your household?
28. When is control the tightest?

Social Network of wild meat Traders

29. How did you come to know the hunters from whom you purchase meat?
30. Percentage of closest friends who are also traders.
31. Please describe any issues you've had with law enforcers while trading in wild meat.
32. Estimate the number of people in powerful positions that purchase wild meat from you regularly.